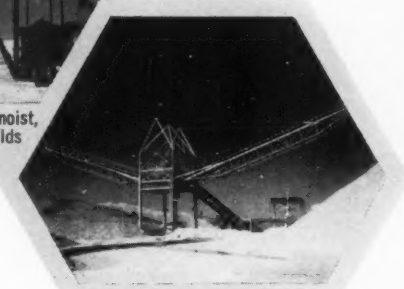
january 1958

nlgi spokesman

journal of the national lubricating grease institute

"In 14 months...not a single bearing lubrication failure with lithium-base grease!"

Conveyor-stacker handling moist, sticky material which builds up on the rollers.



Ore unloading conveyor rollers handling 200 tons of ore per hour.

THE PROOF IS IN THE PERFORMANCE...

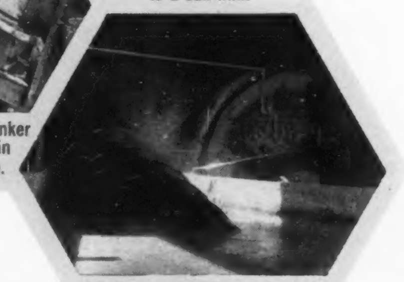
lithium-base grease does the job...

and does it better!

Pinion gear transmitting power from 600 h.p. motor to a ball mill.

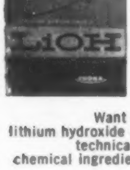
Pan Conveyor handling hot clinker (1600°F), roller bearings in dusty, moist atmosphere.

Leach tanks handling hot slurry, agitators driven by Falk gear reducing units.



V.A. Wemco classifier, part of wet grinding system, lower bearing submerged in hot sludge.

Here's a report of our own experience with lithium-base grease under extreme industrial service conditions. Approximately 95% of the grease used in the plant of AMERICAN LITHIUM CHEMICALS, Inc., our subsidiary at San Antonio, Texas, is lithium-base, one-type grease. In fourteen months operation we have not been able to trace a single cause for bearing failure to the lubricant used. The on-the-spot photos above give graphic evidence of the rugged bearing service requirements in this plant where lithium ores are processed into high-grade lithium hydroxide, itself an important ingredient in lithium-base grease. Performance like this is why grease chemists, manufacturers, marketers and users all attest to the superiority of lithium-base... the *one* grease in place of *many* for efficient and economical operation.



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NLGI PRESIDENT'S PAGE

By R. CUBICCIOTTI, *President*

A New Threshold

As we enter the New Year, we find ourselves on the threshold of a great national awakening in which our industry is destined to play a role.

The hurling of the first man-made satellites has challenged this nation to re-evaluate its approach to defense. In a similar way, it has challenged us to re-evaluate our approach to the teaching of science.

That we will meet the challenge, there is no doubt, and the result will be exciting things to come in the realm of rockets and space ships and interplanetary travel.

The corner of the secrecy curtain has been raised and little bits of the future picture are beginning to come into focus. Speeds have suddenly left us far behind. No sooner do we learn how to spell "supersonic" than the word becomes obsolete, to be replaced by "hypersonic." Rocket speeds of 18,000 miles per hour are the order of the day, producing mechanical problems of fantastic complexity in the motors and guidance system, to say nothing of the frictional heat generated in the skin of the rocket by its very speed, so that today almost every citizen is aware of the re-entry problem, that is, how to get the nose of the rocket back to earth without melting at best, or vaporization at worst.

Fuels have kept pace. The day of jet fuel for defense aircraft use is rapidly nearing its end, just as it is dawning in the world of civilian travel. In its stead are coming the "exotic" fuels. Right now it is the boranes which are favored for ultra high-speed jets, but in the field of rockets, the liquid chemical fuels are threatened by atomic fuels and ultimately, no doubt, by a stream of ions.

Can anyone doubt that these startling changes will produce new demands on lubricating greases, which, in their turn, must become "exotic"?

The concept, of course, is not new. Some companies have been working for years on programs to perfect the grease lubricants that will be needed to meet the requirements of hypersonic flight. Nor are these people the only ones who are aware of the importance of such problems. The Air Force has stated that it considers lubricants just as important as structural materials in machines built for hypersonic flight.

And so it goes. We are not standing still. Our industry, I am proud to say, is moving fast. Perhaps soon, we too will be moving at hypersonic speed.

■

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Manufacture and Application of

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by C. J. Boner

Chief Research Chemist
Battenfeld Grease and Oil Corp.

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Everyone concerned with the preparation or use of grease lubricants will find Boner's book of enormous practical value. Manufacturers and lubricating engineers will find here a complete breakdown of the effects of each ingredient or treatment upon the characteristics of the final product, and a full explanation of the physical and chemical methods used in measuring these characteristics. Suppliers of fats, oils, additives, thickeners and other raw materials will gain new ideas for future product research and development. In addition, users of grease products will learn the properties of available lubricants and the major purposes that each fulfills.

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IN THIS ISSUE

THE COVER

THIS strip of film is taken from a scene in the new NLGI movie "Grease, the Magic Film" and shows the rugged conditions road building contractors face while constructing the nation's new super highway system. Good news for members . . . "Grease, the Magic Film is being well received. Also, the NLGI Annual Meeting's panel on lubrication of contractor's equipment turned up a great exchange of information for all concerned . . . contractor, equipment builder and lubricant supplier. The first presentation of the series begins on page 15 of this issue, with R. L. Nelson's article, "Earth Moving Equipment Must Pay Off."

FIGURE 1 compares oils containing two different additives.

The Deve
Application of a
Range

ADD

By R. K. Williams, W. C. Brandow

and J. W. Schulte, Lubrizol Corporation

Presented at the IOCA Tenth Annual Meeting

IT IS GENERALLY agreed that many of the rear axle lubricant marketing and performance problems would be solved through the availability at a reasonable price of a truly multi-purpose gear lubricant—one which would simultaneously meet the most severe performance requirements of truck and passenger car service, and which at the same time would be satisfactory with respect to rust protection, stability, compatibility, corrosion, and a host of other properties. As so aptly pointed out by Mr. C. M. Heinen at the Independent Oil Compounders Association meeting in Chicago a year ago, the incentives for development of this class of products were tremendous. The task was one which required active cooperation in many areas between the equipment, petroleum, and additive industries and involved the expenditure of hundreds of thousands of dollars. Because the program carried out by the Lubrizol corporation is more or less typical of similar programs by other major additive suppliers, a brief description of some of its aspects should prove interesting.

Before discussing the development and application of these new additives for gear oils, it is worthwhile even at the expense of repeating information published on numerous occasions to review briefly the factors indicating that improved lubricants were required. Heinen has summarized the sharply increasing trends in engine horsepower and gross weights of passenger cars and trucks during the last decade[1]. It is one matter to deliver this increased horsepower and torque to a rear axle. Transmitting it through the third member to the wheels by means of a differential of limited size, weight, and design is somewhat more difficult. To add to this, the minor changes that have been made in rear axle design have been in the direction of smaller units or increased offset of the pinion gear to permit reductions in vehicle height. These, instead of reducing the demands on the rear axle lubricant, have made them more severe[2]. This has been amply proven by surveys and field tests. For example, in 1951 and 1952 scoring difficulties in passenger cars with the SAE 80 grade oil were reported in Canada. At about the same time independent surveys in the United States also indicated improvements in factory fill oil and, more importantly, service station refill oil would be desirable. It was also reported that wear, particularly of thrust and carrier bearings, was a problem in passenger car axles

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operated with lubricants of high sulfur activity. To summarize, there were strong indications that hypoid gear lubricants were being overstressed under extreme high speed and high torque service conditions and that for satisfactory operation under such conditions there was need for improvement.

At the same time occasional gear tooth failures in heavy duty trucking indicated a need for greater extreme pressure quality in the lubricants available. As a result, both passenger car and truck manufacturers were interested in improved lubricants which would help overcome some of the problems they were experiencing in the field.

Because of their importance these developments in the field of rear axle lubricants had been followed very carefully, and during 1952 an extensive research and development program was initiated by the Lubrizol corporation to develop an additive which would fulfill all of the requirements of passenger car and truck axles. The target was the development of a concentrate which, when compounded with high grade rear axle lubricant base stocks in either the SAE 80 or 90 grade, would meet the following requirements:

Table 1

Full Scale Axle Tests in Early Development Work On New Gear Lubricant Additives

Laboratory Tests	*No. of Tests*
Laboratory high torque tests using CRC L-20 and 1½ ton axle simulated severe mountain service tests	111
Laboratory shock tests using the Chevrolet shock test procedure	32
Laboratory shock tests using the Buick 10A test procedure	167
Laboratory moisture corrosion tests using the CRC L-21 test procedure	23
	333
Chevrolet shock and high speed road tests	17
Extended road tests of 10,000 miles or more	
Passenger Cars	
Chevrolet	14
Buick	13
Oldsmobile	10
Ford	2
DeSoto	6
Dodge	37
Plymouth	2
Trucks	
GMC (Eaton 16600 hypoid axles)	3
International (Eaton 36M dual hypoid axles)	3
	107
Grand Total	440

1. Pass the high speed anti-scoring requirements of the Buick 10A shock test, one of the most severe performance tests for passenger car rear axle lubricants.

2. Pass the CRC L-20 test which was the accepted measure of performance in heavy duty trucking service.

3. Pass a special high torque, 1½ ton axle test which simulated severe mountain trucking service.

4. Minimize wear of gear tooth contact surfaces, ball and roller bearing parts, and differential components.

5. Protect against rust and corrosion in service and storage.

6. Minimize stain and deposits after long periods of service.

The thorough history and development of gear lubricants presented in this paper will be followed next month with a paper, "General Motors Looks at Rear Axle Lubricants—September 1957," by N. A. Hunstad.

7. Be compatible with gear lubricants.

8. Provide the thermal stability necessary to permit storing of the additive concentrate and finished lubricant blend under reasonable conditions.

Thousands of chemical and physical bench tests were made during this development program, and as shown in Table 1, 440 full scale passenger car and truck hypoid axles were tested before finalizing the special combination of chemicals meeting the requirements outlined above. Of the 440 full scale tests 333 were run in the laboratory. The remaining 107 were extended road tests of passenger cars and trucks. Table 2 outlines the essentials of the procedures used for the laboratory evaluations while Table 3 discusses the general operating conditions for the road test work.

These efforts culminated in the development of an effective additive recommended for use at 13% by weight in finished gear lubricant formulations. Exhaustive field tests confirmed that gear lubricants formulated with this additive would fulfill all of the requirements of severe passenger car and truck service, and that they constituted a marked improvement over the accepted MIL-L-2105 grade products.

On the basis of the laboratory and field test data, samples were released to automotive manufacturers for evaluation. Their tests included a variety of high speed procedures and full scale proving ground endurance tests which confirmed previous experience and showed the product fully equivalent to the factory fill lead soap-active sulfur. At this point several manufacturers

Table 2
Outline of Laboratory Test Procedures

CRC L-20 Test

A 30- hour high torque, low speed test using a ¾ ton Army truck hypoid axle with a gear ratio of 5.83:1. Lubricant temperature is allowed to cycle between 200°F. and 250°F. during test operation of 62 RPM axle shaft speed and ring gear loading of 32,311 inch-pounds (4950 P.I.F.).

1½ Ton Axle Simulated Severe Mountain Service Test

A 35-hour cycling test of predominately high torque operation using a 1½ ton Dodge truck axle. Ring gear speed varies between 53 and 108 RPM while ring gear loadings up to 75,000 inch-pounds (6250 P.I.F.) are applied. The lubricant temperature is allowed to seek its own level.

Chevrolet Shock Test

Using a standard Chevrolet axle of 4.11:1 ratio, the test includes high speed driving in addition to deceleration cycles in second and high gears. Ten deceleration cycles are performed in second gear with shock loadings applied (clutch engaged) at 50 MPH after coasting from 55 MPH. Fifteen deceleration cycles are performed in high gear with shock loadings applied at 70 MPH after coasting from 75 MPH.

Buick 10A Shock Test

Ten acceleration-deceleration cycles between 70 and 100 MPH are followed by three shock loadings (downshift from "drive" to "low") at 65 MPH after coasting from 75 MPH. An additional ten acceleration-deceleration cycle between 70 and 100 MPH is then performed.

CRC L-21 Test

The propeller shaft of a Chevrolet gear case is rotated for 4 hours at 2400 RPM. Two per cent of distilled water has been added to the lubricant and temperature maintained at 180°F. The axle is stored for 10 days before inspection for rust.

Table 3
Brief Outline of Road Test Operating Conditions

Chevrolet Shock and High Speed Tests

Using 1952 Chevrolets with powerglide transmissions, approximately 1,160 miles were obtained under high speed driving and shock loading (downshift from "drive" to "low") conditions. Approximately 100 acceleration-deceleration cycles were performed between 70 MPH and top speed, in addition to 24 shock loadings at speeds up to 68 MPH.

Extended Road Tests, 10,000 to 25,000 Miles

Thirty-seven 1953 Dodges and nine 1953 Buicks were employed in "normal driving" tests consisting of home-to-work type of suburban and city driving.

Sixty-four 1952 and 1953 cars of assorted makes were employed in carefully controlled high speed operation over open roads at 65 MPH.

High Speed Truck Tests

Three GMC trucks using the Eaton 16600 hypoid axle were operated by commercial haulers under normal high speed conditions between Pontiac, Michigan and Chicago, Illinois. Mileage accumulated was approximately 100,000.

Mountain Service Truck Tests

Three International trucks equipped with Eaton 36M dual hypoid axles were operated by commercial ore haulers in mountainous sections of Colorado. Mileage accumulated was approximately 50,000.

became actively interested in the product for original fill. One of the major reasons for this interest was a marked reduction in wear of differential parts as compared to the lead soap-active sulfur type of factory fill product.

It was here that cost entered the picture. Lubricants formulated with this additive were more expensive than active sulfur oils, and in view of the number of cars being produced it was understandably quite difficult for the manufacturing people to take an approach which substantially increased original lubrication costs. As a result, interest lagged in the new gear lubricant additive.

Interest was renewed late in 1953 after the U. S. Ordnance department had reviewed the results of tests at the Yuma, Arizona proving grounds which showed that MIL-L-2105 lubricants were not satisfactory in certain types of equipment under controlled test conditions of extremely high torque[3]. Failures in certain vehicles were evidenced by ridging and rippling of ring and pinion gears, and by the complete physical deterioration of certain gear oil types. This experience again altered the picture by pointing out that greater high torque performance than provided by MIL-L-2105 products was required. Of course, this meant a complete rebalance of additives and nullified much of the earlier work.

Concurrently with developments at Yuma, the automotive industry again indicated interest in improving the MIL-L-2105 product to provide greater resistance to scoring in passenger car axles. Definition of the exact performance level desired by the automotive industry presented a difficult problem. Tests by the passenger car manufacturers using reference oils developed by Sands helped greatly to clarify the problem.[1] Using the reference oils it was found that the present MIL-L-2105 products were equivalent in high speed performance to reference oils 4 to 6. Lead soap-active sulfur was equivalent to reference oils 14 to 15. It was also concluded from these tests that broken-in passenger car axles would be free from scoring in the field with oils having performance levels equivalent to reference oil 10 or better. With this information it was possible to define the requirements for the new products. These requirements are listed below and outline the essential elements under consideration for the new Military gear lubricant specification.

1. Pass the CRC L-37 test, a higher torque version of the L-20 test previously used to indicate performance in heavy duty trucks.

2. Perform as well as reference oil 10 in a high speed test designed to insure satisfactory performance in broken-in passenger axles.

3. Prevent rusting as well or better than present MIL-L-2105 products as defined by CRC L-13 panel test and also a 20-hour axle moisture corrosion test.

4. Resist foaming, deposit formation, etc. equivalent to present MIL-L-2105 products.

5. Be compatible with present MIL-L-2105 products and with products meeting the new gear lubricant specification.

6. Be capable of storing, blending and handling in production and in the field.

Table 4 describes briefly several of the test procedures needed for these evaluations.

It is a credit to the petroleum, equipment, and addi-

Continued on page 12

Table 4
Outline of Laboratory Test Procedures

CRC L-37 Test

Employs a ¾ ton Army truck hypoid axle with a gear ratio of 5.83:1 powered by a 1955 Chevrolet truck engine. A high speed cycle of 100 minutes, 400 RPM ring gear speed and 9,460 inch-pounds (1420 P.I.F.) of ring gear torque, and 300°F. maximum lubricant temperature is followed by a 24-hour high torque cycle. This includes 80 RPM ring gear speed, 41,800 inch-pounds (6400 P.I.F.) ring gear torque, and lubricant temperature of 275°F.

High Speed Test

In principle, the test under consideration is a dynamometer test using a passenger car axle which involves accelerations and decelerations to provide shock loading of both drive and coast sides of the gears. Drive side maximum tooth loading is approximately 6,000 pounds per inch of face on the drive side and 4,000 pounds on the coast side.

CRC L-13 Test

Using a steel paddle, 200 grams of oil and 5 ml. distilled water are stirred at 550 RPM for 4 hours at 180°F. The paddle is inspected for rust formation.

20-Hour Axle Moisture Corrosion Test

Using a lubricant containing 2% distilled water, a spicer axle is motored at 2500 RPM for 4 hours at 180°F. The complete axle assembly is stored under controlled conditions for 20 hours and then inspected for rust deposits.

Special Bearing Rust Test

A special bearing assembly, under load, is stored in an oil-water medium at elevated temperatures.

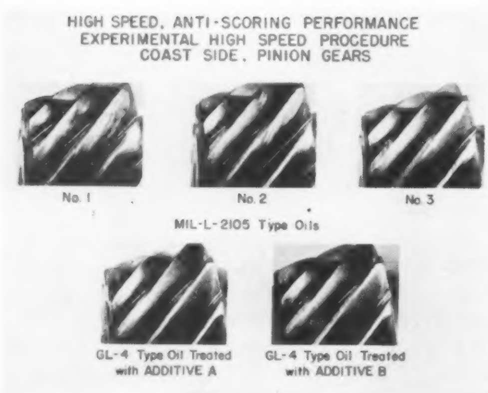

FIGURE 2. Coast sides of pinion gears illustrate freedom from scoring, and better gear tooth condition with new oils.

tive industries that several lubricants meeting the requirements listed above have been developed and introduced commercially in recent months. The American Petroleum Institute has given careful consideration to these new gear oils and designated them "for A.P.I. GL-4 service" suitable for use under the extreme operating conditions often called for in today's passenger cars and heavy duty vehicles. No gear lubricant paper would be complete without comparing their performance characteristics with those of typical MIL-L-2105 products and other commonly accepted oils.

Figure I compares the high speed, anti-scoring protection of oils containing two different commercial additives, A and B, meeting proposed specification requirements, with the performance of a typical MIL-L-2105 product. The Buick 10A shock test, which is one of the most severe procedures for evaluating this type of performance, was used. The coast sides of the pinion gears illustrate the freedom from scoring and greatly improved gear tooth condition obtained by using the new GL-4 oils. Figure 2 further compares the gear tooth condition using a high speed test very similar to the one which will probably become part of the new military specification. The improvement in resistance to scoring afforded by the GL-4 lubricants is readily apparent.

To illustrate the improved anti-wear feature of the GL-4 products in actual passenger car service, Figure 3 compares the 1956 Oldsmobile gears, pins and differential parts from high speed field tests conducted in San Antonio, Texas. Mileage accumulated was approximately 50,000, and lubricant types were lead soap-active sulfur and a GL-4 type oil treated with additive A. While the lead soap-active sulfur product shows severe wear of the differential components, there is no sign of distress on the differential pins and pinions lubricated with the new gear oil containing additive A.

Other extensive field service tests in passenger cars under high speed, durability, shock and endurance conditions have been summarized by Raymond[2]. In a number of these tests it is reported that axle failures had been encountered with the factory fill or factory-specified lubricant, while change to the new type oil completely eliminated the difficulties.

An example of the improved high torque protection offered by the new GL-4 oils is presented in Figure 4. These photographs illustrate the drive side of the pinion and ring gear teeth from CRC L-37 tests conducted on two of the new type oils, compared with a typical MIL-L-2105 product. Heavy ridging has occurred on the tooth surface lubricated with the latter product, while with the improved oils containing additives A and B there is no evidence of surface distress.

FIGURE 3 compares the 1956 Oldsmobile gears, pins and differential parts from high speed field tests in Texas.

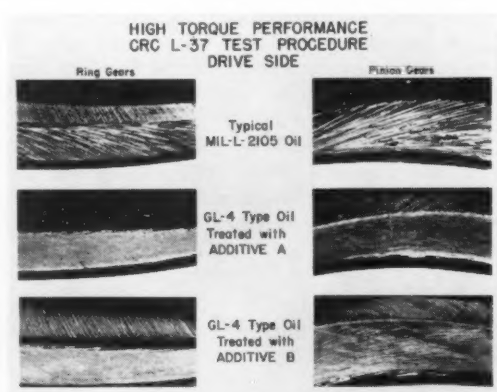

FIGURE 4 shows an example of the improved high torque protection offered by new GL-4 oils in CRC L-37 tests.

Field test data under high torque conditions further confirm the extra protection afforded by GL-4 products in the L-37 tests. During the 1955 and 1956 Ordnance department investigations at Yuma, Arizona test station, MIL-L-2105 oils produced scored and ridged gear tooth contact surfaces in equipment most sensitive to lubricant quality. The new oil types, however, gave very satisfactory operation[3]. Other extended field tests in heavy duty trucks, including those utilizing worm gear axles, have served to confirm the advantages of the new oils. The worm gear tests included many thousands of miles of high speed, over-the-road driving, as well as operation in mountainous areas of the United States. Evaluations in hypoid designs were equally extensive and satisfactory.

Figure 5 illustrates the pinion and ring gear teeth after 100,000 miles of operation in the hypoid axle of a GMC truck operated under high speed, heavy load service conditions using the improved type lubricant formulated with additive A. Drivers reported no noise or difficulty with the axles, and close inspections have revealed good gear condition as represented by the smooth polish and light wear on ring and pinion contact surfaces.

To indicate the rust protection offered by the improved gear oils, Figure 6 presents the stirring paddle from the standard L-13 and a back cover plate from a 20-hour axle moisture corrosion test. In addition,

FIGURE 5 illustrates the pinion and ring gear teeth using the improved type lubricant formulated with additive A.

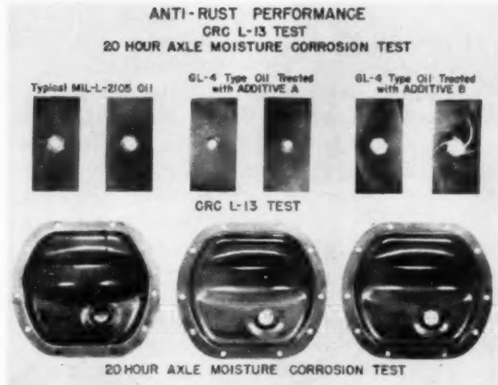

FIGURE 6 presents the stirring paddle from the standard L-13 and a back cover plate from a 20-hour axle test.

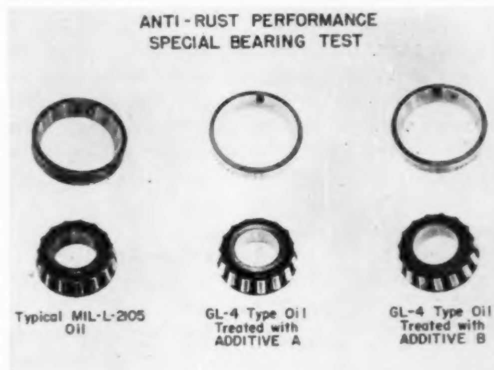

FIGURE 7 illustrates the races and rolls from special bearing test evaluating anti-rust characteristics (table 4).

Figure 7 illustrates the races and rolls from a special bearing test evaluating anti-rust characteristics as described in Table 4. The lubricants consist of a typical MIL-L-2105 oil and two GL-4 types, treated with additives A and B. Results confirm that equivalent or superior rust properties are obtained with oils containing the new additives.

Thermal stability characteristics of gear lubricants are dependent upon properties of the base oils as well as the type and amount of chemical additive present. For example, the 1953 Yuma field tests illustrated that certain MIL-L-2105 oils were susceptible to deterioration and excessive deposit formation. In the 1956 Yuma tests it appeared that undue increases in additive treatment with the chemical types required for GL-4 performance might produce increased deposit formation. In order to evaluate these properties more thoroughly, several different laboratory tests are currently being used to investigate oxidation and thermal stability characteristics. Indications both in the labor-

atory and in the field are that base stocks of reasonable quality, properly formulated with GL-4 type addition agents, are satisfactory in this regard[5].

Standard laboratory tests and extensive service experience have demonstrated that the new, improved gear lubricants will not cause any difficulties due to corrosion, foaming, or compatibility characteristics.

Handling considerations of finished oil blends of GL-4 type performance are essentially the same as with MIL-L-2105 oils. It should be noted, however, that the chemical additives necessary to meet the more severe full scale axle tests have a higher level of activity than previous commercial additive agents. Accordingly, certain precautions should be used in storing, handling, and blending the cencentrated additive materials. Excessive heat should be avoided in order to prevent decomposition. Heating coil skin temperatures should not exceed 150° - 175° F., and bulk storage temperatures should be kept below 100° F. for the pure additive concentrate.

Test development programs on advanced oil types are never complete until considerable actual operating experience has been compiled with the final product[6]. This is particularly true as it applies to performance in the new slip-limiting differentials where there is little reliable experience but where promising developments are underway. In conventional equipment, on the other hand, the GL-4 products have compiled millions of miles of trouble-free field service. All of the field experience to date has been most encouraging and has confirmed the laboratory data which have been obtained. At this point there is no doubt that lubricants intended for GL-4 type service represent a significant advance over the products they are designed to replace and that they are another step toward a truly multi-purpose gear oil.

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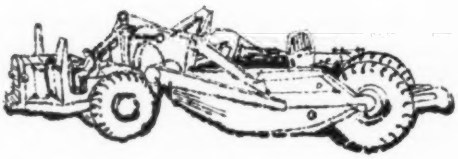
Earth Moving Equipment Must Pay Off



This is the first of a series of articles presented at the NLGI 25th annual meeting panel, "Lubricating of Contractor's Equipment," in October 1957. The remaining series will be published in succeeding issues of the NLGI SPOKESMAN.

Presented at the NLGI 25th annual meeting in Chicago, October, 1957.

By R. L. Nelson
S. J. Groves and Sons Company

"SIDEWALK SUPERINTENDENTS" watching the construction of a building or a highway often marvel at the ease with which difficult operations are performed. They would be equally impressed if they could go behind the scenes and meet the men that direct these operations. The thousands of companies that make up the highway construction industry are typically headed by old-fashioned individualists. Two-fisted, self-reliant, determined men who are willing to gamble a fortune that their estimated costs on a particular job are correct. The majority have gotten their start out on construction jobs, where "softies" do not last long, and where a man expects to sweat and eat dust in summer, work 16 hours a day, repair tractors out in the mud and snow, if necessary, and overcome obstacles in stride. Physical difficulties are their stock in trade, as are the risks inherent in outdoor construction involving constantly changing soils, weather, and other unforeseen contingencies. Most have started small and have built prosperous companies by matching their wits in free competition.

S. J. Groves & Sons company was established and propagated by such men. Stephen J. Groves, together with his sons Frank, Herbert, and Clarence, established the firm at Minneapolis, Minnesota, in 1905 as a small basement excavating company using horses and dump wagons as their main tools. Under their leadership, it has steadily grown to become one of the largest heavy construction firms in the United States. We specialize in the construction of airports, bridges, dams, toll roads, and other heavy construction. At the present time, most of our work is concentrated in New York, New Jersey, Michigan, Ohio, and Illinois. Just recently we were awarded the contract for construction of the first section of the new Ohio North-South Freeway which will eventually run from Conneaut to Cincinnati.

The construction industry today is a highly competitive, complex business that requires a company to be very progressive in order to survive. A contractor must have a strong financial position; wide organizational and administrative ability; a capable, experienced engineering and supervisory staff; sound labor relations; efficient equipment and tools; all available for any particular job.

Today's highly mechanized road contractor literally builds his business operation around equipment ownership and management. Present specifications and modern production methods require the use of a considerable amount of auxiliary equipment in addition to the actual production units. Push tractors for faster loading, motor graders, for maintaining high speed haul roads, sheepsfoot and pneumatic tired rollers for compaction, water trucks for dust and soil moisture control, and bulldozers for grading slopes and fill areas, are some of the units necessary in high-speed dirt-moving operations. The cost of operating these additional machines is included in the bid price re-

ceived for the operation and they must be considered as part of the overhead costs.

An efficient construction operation is usually so organized that every machine is operated near its maximum capacity. Most of the operations are measured in seconds and the loss of one or more production units usually turns a profitable operation into a losing one. For example, the loss of a motor scraper is usually valued from $30.00 to $90.00 per hour, a large shovel up to $500.00 per hour, while any paving machine that stops a paving operation may cost as much as $400.00 per hour in lost production.

Therefore, the purchase of equipment is one of the most important decisions a contractor must make because the choice he makes may be the difference between a profitable or a losing business. Equipment manufacturers have developed many new and radically different models of earth moving machines and have increased the output of standard production units considerably by increasing engine horsepower, adding new types of power trains such as oil clutches, torque convertors, power shift transmissions, planetary gear wheel drives, and modifying them in general with an accent on increased speed and high production. In many cases, the new models are just "souped-up" versions of standard production models. Today's construction equipment market is flooded with a great variety of different makes and types of equipment, and the selection of the proper machine is difficult. Careful consideration should be given to the following points when buying equipment:

(1) *The present and future need for the machine.* Most contractors large and small are "equipment poor." They usually have most of their money tied up in equipment and are forced to borrow large sums of money to have enough working capital to finance their operations. Therefore, there must be a considerable amount of present and future work for the machine to justify the purchase.

(2) *Multi-use machines are usually the best buy in the long run.* A specialized machine might make more profit on one job but another more versatile one would do the job as well and over a period of time prove to be more profitable.

(3) *Standardization of equipment.* The machine should fit into the fleet of equipment presently being operated. Maintenance problems and parts inventories are reduced and operational availability is increased when a fleet is standardized.

(4) *Total production of machine.* There are many machines on the market today that perform sensationally for short periods of time and many contractors have purchased them much to their sorrow. Most of these machines are still in the experimental stage and considerable lost time and production is encountered due to breakdowns requiring extensive repair work and field engineered modifications. Over 50 per cent downtime is frequently experienced because of the lack of repair parts and service. It takes years to engineer, build, and field-test a good earth-moving machine, so the best equipment buy is still the proven machine that operates steadily with a minimum amount of downtime.

5. *Repair parts and services available.* A machine side-lined for repair is useless. Careful consideration should be given to the type of service rendered by the equipment dealer in the past. Repair parts are becoming more difficult to obtain because dealers do not have the facilities nor the capital to stock parts for all the new models. Most dealers will not stock a repair part unless the sales record shows that a minimum number of three are sold each year.

The additional maintenance problems arising from the completely new and radically different type machines, coupled with those presented by the "souped-up" standard units, have increased the load on supervisory and maintenance personnel to the extent that a contractor without an organized preventive maintenance program operated by experienced personnel is lost. It is generally recognized as good common sense to do the things in maintenance that will prevent serious failures later on. Not only is the repair cost of a failure to be considered, but equally important is the unit downtime and costly loss of production. Real "preventive maintenance" is an organized effort to perform periodic lubrication and maintenance work in order to avoid unnecessary breakdowns of equipment.

No one disputes the fact that preventive maintenance for construction equipment is a paying proposition. Those who have practiced it for any length of time report substantial savings in repair costs and a considerable increase in equipment availability.

Then why do contractors who have invested hundreds of thousands of dollars in fine equipment usually fail to practice preventive maintenance?

Actually there are several answers to that question.

(1) Preventive maintenance programs are difficult to set up.

(2) They take "too much" paper work and office work.

(3) Often without supervisory follow-through, they will "fizzle out."

Of these three, only number one is fully justified—with proper planning and supervision, the other two need not be true.

The organization of a preventive maintenance program consists of:

(1) Performing regular scheduled lubrication and maintenance operations using check sheets similar to those used in aircraft maintenance. These

operations can be done off-shift by a shift other than the operating shift.

(2) Setting up a control system using control forms to see that the program is carried out. This control system also helps evaluate the program's success.

The paper work of a preventive maintenance program takes only a few minutes daily, the shop work takes only a few hours, and by preventing more complicated failures later on, operating costs are reduced.

If a preventive maintenance program is to accomplish the goal of preventing failures and breakdowns, it must be practiced not only in the field and repair shops by mechanics, but also in the front office by management, on the job by superintendents and foremen, and on the machine by the operator.

Proper lubrication of equipment is one of the mainstays of any maintenance program. A few years ago, the selection of the proper lubricant for any specific application usually resulted in several recommendations that always left a doubt as to the correct one to use. One oil manufacturer made suggestions on one of our jobs that would have required the use of over 25 different types and weights of oil and greases to fulfill his recommendations. In 1954, we made an intensive study of the various manufacturers' recommendations for lubrication of our equipment and decided to cut the number of lubricants required to a bare minimum. We are at the present time using only six types of oils and greases to lubricate our entire fleet on the new Ohio Freeway project. They are as follows:

(1) *Series Three Engine Oil* is used in all our diesel engines. Laboratory tests enabled us to extend the crankcase drain periods so that the over-all cost of the higher quality oil is less than a cheaper grade.

(2) *Series One Engine Oil* is used in all gasoline engines, hydraulic systems, and air cleaners.

(3) *Extreme Pressure Gear Oil*—MIL-L-2105 is used in all transmissions, differentials, final drives, and other gear cases.

(4) *Extra-Heavy Multi-Purpose Lithium Base Grease* is used for wheel bearings, and for power shovel and mixer applications.

(5) *Multi-Purpose Lithium Base Grease* is used for all chassis and pressure gun applications including track rollers.

(6) *Open Gear Grease*—One manufacturer had the foresight to package a quality open gear grease in a tube that permits application with a caulking gun, thus eliminating the problem of how to get oilers to keep open gears properly lubricated. The best grease is inadequate if it is too difficult to apply.

Our lubrication problems have been reduced considerably with the help of field service engineers and through intensive employee training programs. Equipment and grease manufacturers have been extremely helpful by providing many fine maintenance reference books and charts. Maintenance personnel are looking forward to the development or improvement of the following maintenance aids:

(1) A permanent type anti-freeze which would be compatible with engine oil in case of crankcase dilution.

(2) Pocket-sized, plastic-covered, lubrication recommendation cards for use by field personnel.

(3) Packaged open gear grease for use with caulking guns.

(4) A standard color code for identifying different types of lubricants.

(5) More rigid and exacting lubrication standards for construction equipment.

(6) More service literature and training schools.

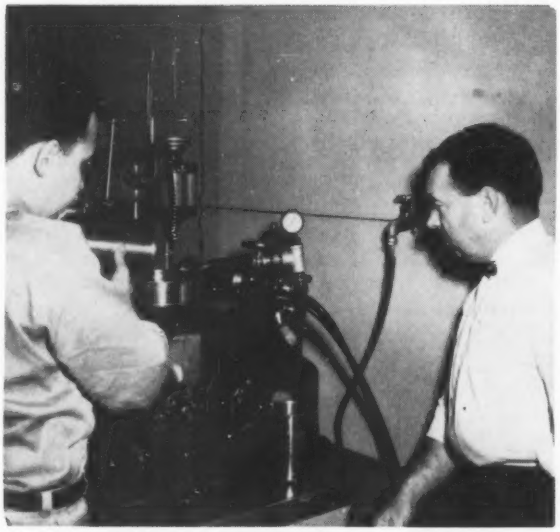
A customer who is well satisfied and thoroughly understands a product is usually one of the best salesmen for that particular product.

The proposed multi-billion-dollar road building program presents a tremendous challenge and affords an excellent opportunity for manufacturers and contractors alike. Competition will be tough and we will all have to battle high costs. Through mutual cooperation we will do the job better, faster, and more efficiently.

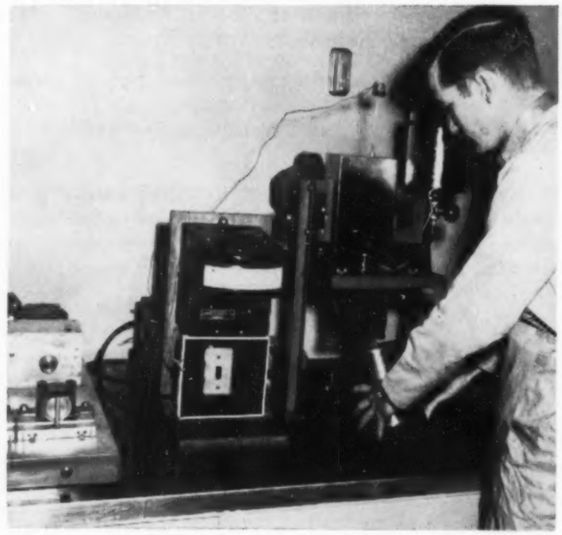
"The difficult is done immediately, and the impossible takes a little longer." ■

About the Author

R. L. NELSON *is an equipment superintendent for S. J. Groves and Sons company. He is in charge of repair and maintenance operations of projects on the Ohio and Indiana toll roads and various other projects in Ohio and Michigan. Nelson has had a wealth of experience on the repair and maintenance of construction equipment during the past sixteen years, since he joined the company. Nelson is a graduate of Augsburg college.*



THE author (right) and assistant pouring grease into tester.



"EFFECT of shear level on mechanical stability was studied."

Shear Stability of a Bento

By H. F. SUTTER

CERTAIN NON-SOAP THICKENING agents for lubricating fluids are being used commercially for the production of lubricating greases. Such products contribute a colloidal structure to the system and should not be confused with fillers which provide body to the system merely by their bulk. Various types of chemically or physically modified clays have been suggested as thickeners but organophilic bentonites were the first such thickeners to have widespread use in the manufacture of lubricating greases. Organophilic bentonites, commercially available under the trade name Bentone*, have been discussed in detail by Jordan [1,2] and his co-workers, while the use of Bentone thickeners in lubricating greases has been described by Finlayson and McCarthy,[3] Compondu,[4] and Fariss.[5]

The fact that the structural particles in organophilic bentonite greases should be more resistant to shear than soap fibers seems to be demonstrated in use. A report[6] covering 27 different Bentone greases, all containing 9.7 percent of the bodying agent, showed that when these greases were worked 1000 strokes about one-third stiffened slightly. Only about one-fourth broke 4 percent or more.

In his paper,[5] "Some Aspects of Bentone Greases," Fariss shows that the breakdown of some Bentone greases as determined by the ASTM Method D-217-52T is not permanent but represents an orientation of some type. In some Bentone greases which show appreciable breakdown on working, the breakdown seems to be a function of the differences in shear levels applied to the grease. The high shear level applied by the high speed and closely set mill used in achieving dispersion of the Bentone in the oil produces a grease which has a particular consistency and is mechanically stable at

*Registered trademark of Baroid Division, National Lead Co.

"GREASES were milled in a kettle mill at room temperature."

ne Grease

Baroid Division, National Lead Company

that shear level. The same grease when subjected to another shear level such as that applied by the ASTM grease worker may adjust its consistency to the new shear level and then again display mechanical stability while that shear level is maintained. This shear level adjustment is shown in Figure 1 for a Bentone grease worked separately in the regular ASTM worker and in a fine hole worker. The consistency of the grease was measured in succeeding 1000 stroke steps. The change in consistency was fairly rapid during the initial stages of working followed by a leveling of the consistency as the working continued. The differences in the consistencies of the samples after "leveling off" is an indication of the two shear levels applied by the separate workers.

The breakdown of the Bentone grease which has been passed first through a mill and then worked in the grease worker is more a measure of adjustment of shear level than of mechanical stability. Further evidence of this effect has been observed in some Bentone greases that show some working breakdown but can be returned to the original unworked consistency by remilling.[5]

A study of the effect of shear level on the mechanical stability of a Bentone grease was made on a grease containing 8% Bentone 34 in a solvent refined oil with 2.5% acetone as a dispersion aid (see Table I). After

Table 1
Mechanical Stability of Kettle-Milled Bentone Greases

Time in Kettle Mill	*ASTM Penetration, mm x 10* 0 *Strokes*	60	1000	10,000	*% Breakd'n* 60-10,000
8% BENTONE 34—No Antioxidant					
0 *Hours*	217	220	243	294	33.6
1	273	285	275	288	1.1
2	288	299	290	295	– 1.3
4	279	285	272	274	– 3.9
6	289	295	285	280	– 5.1
8	290	302	290	285	– 5.6
10	295	295	296	282	– 4.7
8% BENTONE 34—0 5% VANLUBE 26					
0	229	239	240	264	10.5
1	254	260	251	270	3.8
2	265	267	264	275	3.0
4	274	275	268	295	7.3
6	265	268	258	268	0.0
8	275	279	277	282	1.1
10	303	319	315	305	– 4.4
88% BENTONE 33—0.5% BUTLY ZIMATE					
0	240	250	260	302	20.8
1	284	295	292	314	6.4
2	297	310	309	309	– 0.3
4	302	314	313	321	2.2
6	317	329	325	324	– 1.5
8	318	328	312	324	– 1.2
10	344	350	340	330	– 5.7

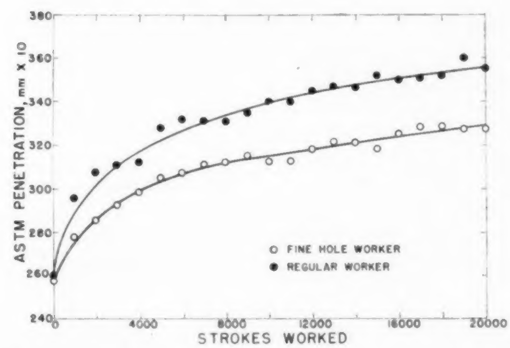
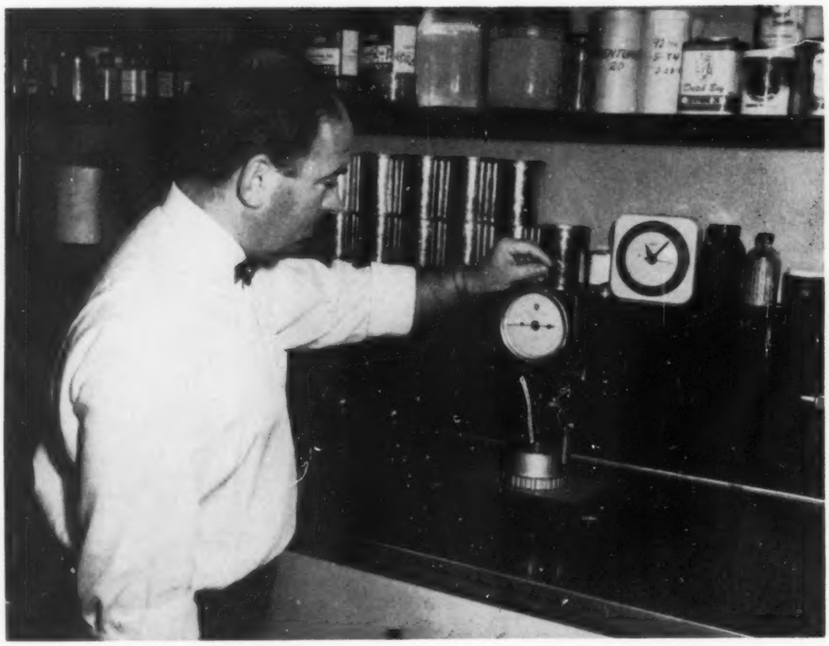


FIGURE 1 Consistency of worked greases in regular ASTM worker and in a fine hole worker for a Bentone grease.

Shear Stability of Bentone Grease

Continued from page 19

"AFTER kettle-milling, the samples were worked 60, 1000, and 10,000 strokes. Three runs were made — one with uninhibited grease, and the two with antioxidants."



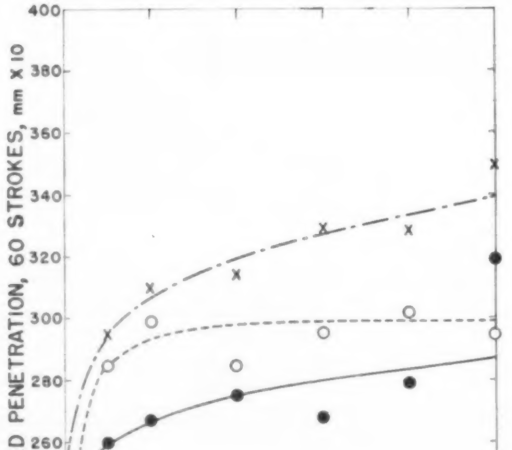


FIGURE 2 Effect of kettle milling on 60 stroke penetration of Bentone greases. Note the slight change in consistency.

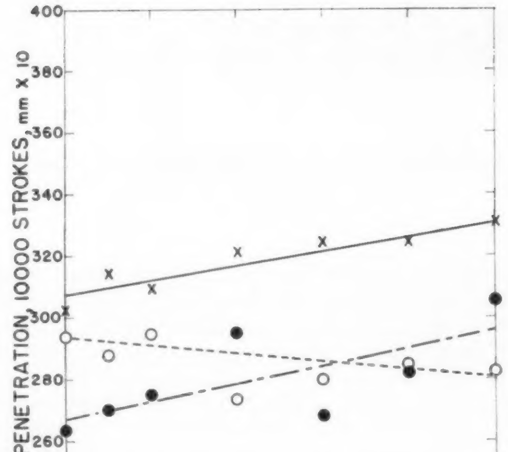


FIGURE 3 Effect of kettle milling on 10,000 stroke penetration of Bentone greases shows good shear level adjustment.

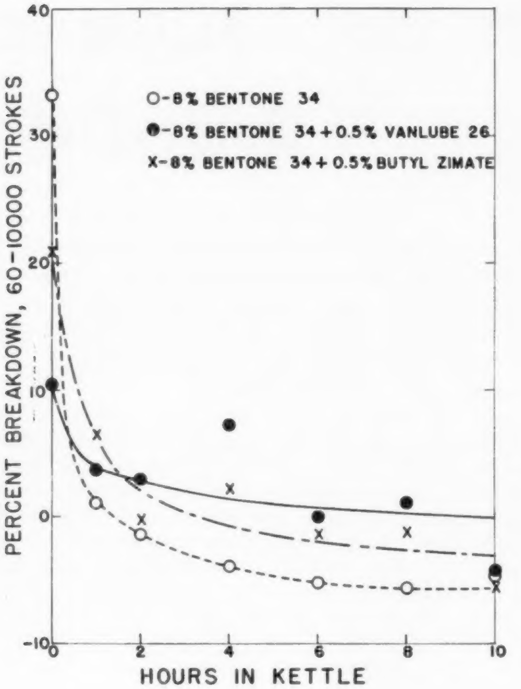


FIGURE 4 shows kettle-mill improvement in mechanical stability of Bentone grease as determined by grease worker.

forming a pregel, the batch was passed through a Tri-Homo disperser set at 0.001 inch rotor-to-stator clearance. Portions of this grease were milled in a kettle mill at room temperature for various lengths of time. The kettle mill used was a counter-rotating blade mill patterned after that described by E. L. Armstrong.[7] After kettle-milling, the samples were worked 60, 1,000, and 10,000 strokes. Three runs were made; one with an uninhibited grease, and two with antioxidants present.

The worked penetrations of the greases after kettle-milling are shown in Figures 2 and 3. These Figures show that after two hours of kettle-milling the Bentone greases have been adjusted to a shear level near that applied by the grease worker. This is indicated by the slight change in consistency of the greases from working after the periods of kettle-milling. The gradual increase in penetration with continued kettle-milling for the two inhibited greases is probably the result of some degelation caused by the antioxidants.

The kettle-mill improvement in the mechanical stability of the Bentone greases as determined by the use of the grease worker is shown in Figure 4. After two hours in the kettle the percent breakdown from 60-10,000 strokes changed very little. In fact, two of the greases showed a slight build-up from the continued working.

Summarizing these data, the following conclusions can be made:

1. To achieve low level shear stability in a Bentone grease, it may be desirable to produce an initially heavier grease and then kettle-mill to the desired consistency.
2. Regardless of the previous shear history of the Bentone grease, the consistency after 10,000 strokes is essentially constant for a given formulation.
3. Maximum consistency change occurs within the first hour of kettle-milling. Additional milling is of doubtful benefit.
4. Oxidation inhibitors had little effect on the mechanical stability of the kettle-milled greases.

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1. Jordan, J. W., "Organophilic Bentonites I," The Journal of Physical and Colloid Chemistry, Vol. 53, No. 2, February, 1949.
2. Jordan, J. W., Hook, B. J., and Finlayson, C. M., "Organophilic Bentonites II," Ibid. Vol. 54, No. 8, November, 1950.
3. Finlayson C. M., and McCarthy, P. R., "Bentone Greases," *NLGI Spokesman*, Vol. 14, No. 2, 13 (1950).
4. Compondu, D. H., "Application of Bentone Lubricants," Iron and Steel Engineer, September, 1952.
5. Fariss, R. E., "Some Aspects of Bentone Greases," *NLGI Spokesman*, Vol. 20, No. 10, 10 (1957).
6. Baroid Division, National Lead Company, Technical Release No. G-2-52.
7. Armstrong, E. L., "A Laboratory Five-Pound Grease Kettle," *NLGI Spokesman*, Vol. 17, No. 7, 8 (1953).

About the Author

H. F. SUTTER *joined the Baroid Division of National Lead company in* 1949 *where he is presently engaged in directing their research work on Bentone greases. A* 1941 *graduate of Pennsylvania State college with a degree in physics, Sutter continued his studies into* 1949 *through fellowships at the Mellon institute of industrial research in Pittsburgh. While at Mellon institute, he also studied at the University of Pittsburgh.*

Ball-Joint Quintuplets

By permission of the editors of the Texaco Dealer *the* NLGI Spokesman *reprints below a portion from the October issue of their monthly dealer publication focused on ball joint suspension lubrication and NLGI passes along the information on how one company has met the problem:*

"Something around the front ends of some 1957 Dodges and Plymouths squeaks, grunts, or crunches, and even after a chassis lubrication. Rubber lubricant on the rubber sway bar and frontwheel suspension bushing doesn't help. Car agencies say the noise comes from the front suspension ball-joints and that these joints require a special lubricant, but they all recommend different ones. One of them says a special socket wrench is needed to loosen the joints. What shall we do? Any information will be appreciated."

Texaco's answer to the five dealers who simultaneously made the above queries was:

"You've hit on a honey that caused more than the usual amount of confusion and misinformation. But by winnowing much chaff from little grain we find the following:

1. As shown in the following illustrations on page 24, the upper and lower ball joints are not quite the same and cannot be taken apart without ruining them.

2. The noise occurs in the ball joints themselves (not the rubber control arm or sway bar bushings).

3. Only an occasional car of the above makes is affected, and other makes are by no means immune.

4. The noise occurs on a small bump after smooth pavement at low car speeds, or when the front end is pushed down with the car stationary.

5. Very new low-mileage cars that have been operated mostly on smooth pavement are most subject to the noise. Oppositely, higher-mileage cars, or those that are operated over rough roads either seem to entirely avoid the noise or at least lose it more quickly as the joint "wears in" to better contact.

6. Turning the socket about 90° with respect to its ball is often effective (which explains the allusion above to a "special socket wrench"). Merely

turning the ball stud (as some agencies advocate) does not change the position of the ball itself and is not effective.

7. Though all concerned are continuing to work on this problem, present knowledge indicates that it will be of temporary duration. For example, some of our special industrial-type lubricants work very well but are not widely available.

8. It is, therefore, probable that the absence of lubricant — any lubricant — between the closely fitted parts of the joint is truly responsible. In other words, this is a lubrication rather than a lubricant problem. Chrysler corporation seems to think the same since they've issued the following bulletin:

'There have been complaints of noisy ball joints on our 1957 cars. Primarily, these noises are due to the ball joints not being lubricated properly during the regularly prescribed maintenance operations. Practically all of these complaints can be eliminated by taking extra care during the lubrication of the ball joints. Any of the chassis lubricants currently available may be used with satisfactory results.

'When a car is lubricated while being supported by its own suspension system, an effective block to lubricant flow is created within the ball joint. To be lubricated properly, the ball joints must be unloaded so that the lubricant will cover all parts of the ball and socket surfaces.

'To overcome complaints of this type, the following procedure is suggested:

1. Lift the car at the outer ends of the lower control arms, leaving enough room for a grease gun to be used at the lower ball-joint lubricant fitting. This can be done by using a two-pedestal hoist with the arms extended or by lifting with jacks placed under the lower control arms. As the car is lifted, the lower ball joint will be unloaded and the upper control arm (rebound) bumper will move away from its "stop" on the frame.

Caution: Do not lift the car at the frame front cross-member since this will not unload the ball joints.

2. Apply grease generously to flush out the old lubricant from both the upper and lower ball joints. Grease should flush out completely around the lower

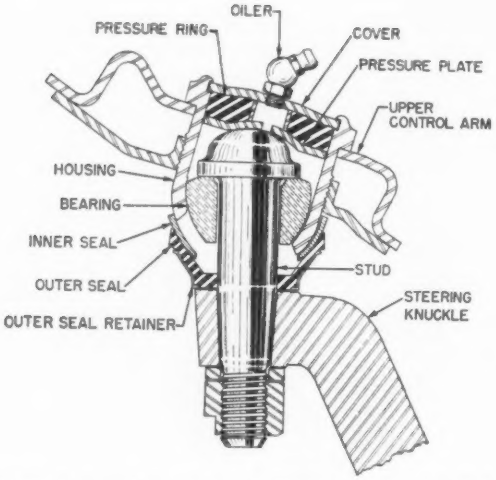


FIGURE 1 describes the front suspension upper ball joint

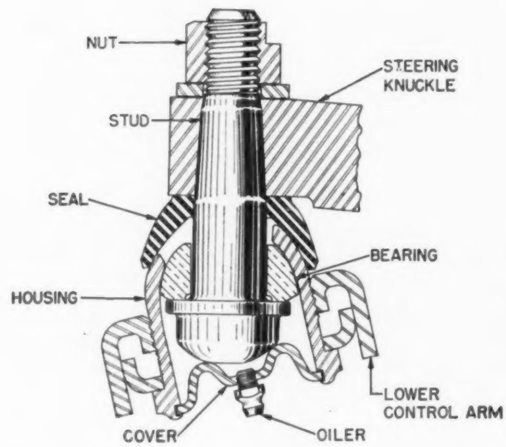


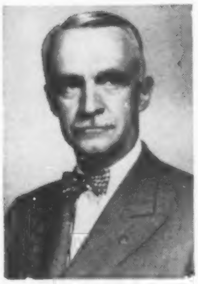
FIGURE 2 describes the front suspension lower ball joint

ball joint and from one side of the upper ball-joint seal; the upper ball joints are preloaded and, therefore, cannot be unloaded to reduce the restriction to lubricant flow. At the time the grease is being applied, turn the front wheels from side to side a number of times to work the lubricant into the ball joint better.

Note: When the grease is applied, there will be an up-and-down movement of the wheel and tire assembly at the steering knuckle. This is evidence that the ball joints are separating under pressure and is not an indication of worn parts.

3. Lower the car to the floor and rock from side to side a number of times. Check for noises.' "

NLGI Honorary Membership



S. BEVIN

S. Bevin was elected to the board of directors in 1940, where he served through 1948. He was NLGI vice president in 1941 and president in 1942. He served on twelve committees and chairmanned three.

H. HOBART

H. P. Hobart became a board member in 1943 rectors in 1935 and continuously served until 1955. He was vice president in 1938 and president in 1939.. He suggested the publication of the NLGI SPOKESMAN.

M. BOWER

M. R. Bower was elected to the board of di- and served until 1955. He was vice president in 1946 and president in 1947. Aiding many committees, he headed development of the constitution and by-laws.

C. KARNS

C. B. Karns served as vice president in 1936 and 1942. He was a director from 1934 to 1952, and treasurer from 1950 to 1952. Program, technical, publicity and finance committees were his main interest.

B. VOSHELL

B. C. Voshell was vice president in 1944 and president in 1945. A member of the board from 1939 to 1948, he served on seven committees, giving particular interest to an early container committee.

M. B. CHITTICK

M. B. Chittick was the second NLGI president serving in 1935. He remained on the board of directors from its formation in 1933 until 1942. He was chairman of the technical committee for seven years.

F. KERNS

F. C. Kerns was a member of the board from 1934 to 1950. He was a vice president in 1941 and president in 1942. He was chairman of the constitution committee which admitted Associate Members.

Future Meetings

JANUARY, 1958

13-17 Society of Automotive Engineers, Annual Meeting, Sheraton-Cadillac and Statler Hotels, Detroit.

22 Independent Oil Men's Assn., Annual Meeting, Hotel Statler, Boston.

22-23 Northwest Petroleum Assn. Annual Meeting, and trade show, Nicollet Hotel, Minneapolis.

FEBRUARY, 1958

2-7 ASTM Committee D-2 Meeting, Rice Hotel, Houston.

10-14 ASTM National Meeting, Hotel Statler, St. Louis, Mo.

12-14 API Division of Marketing, Marketing Research Committee, Biltmore Hotel, New York City.

26-28 API Division of Production, Southern District Meeting, Shamrock-Hilton Hotel, Houston.

27-28 API Division of Marketing, Lubrication Committee Meeting, Sheraton-Cadillac Hotel, Detroit.

MARCH, 1958

4-6 SAE Passenger Car, Body and Materials Meeting, Sheraton-Cadillac, Detroit, Mich.

19-20 Ohio Petroleum Marketers Association, Annual Convention and Marketing Exposition. Deshler-Hilton Hotel, Columbus, Ohio.

31-Apr. 2 SAE National Production Meeting and Forum, The Drake, Chicago, Ill.

APRIL, 1958

9-11 API Division of Production, Mid-Continent District Meeting, Biltmore Hotel, Oklahoma City.

16-18 National Petroleum Association, Cleveland, Ohio

22-24 ASLE Annual Meeting and Exhibit, Hotel Cleveland, Cleveland, Ohio.

MAY, 1958

19-20 API Division of Marketing, Lubrication Committee Meeting, Point Clear, Ala.

21-23 API Division of Marketing, Midyear Meeting, Roosevelt Hotel, New Orleans

22-23 API Division of Production, Pacific Coast District Meeting, Biltmore Hotel, Los Angeles.

JUNE, 1958

8-13 API Division of Production, Midyear Committee Conference, Hollywood Beach Hotel, Hollywood, Fla.

8-13 SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

22-28 ASTM 61st Annual Meeting, Hotel Statler, Boston, Mass.

SEPTEMBER, 1958

10-12 National Petroleum Association, Atlantic City, N. J.

OCTOBER, 1958

14-16 ASLE-ASME Joint Lubrication Conference, Hotel Statler, Los Angeles, Calif.

20-22 SAE National Transportation Meeting, Lord Baltimore Hotel, Baltimore, Md.

22-24 SAE National Diesel Engine Meeting, Lord Baltimore Hotel, Baltimore, Md.

27-29 NLGI Annual Meeting, Edgewater Beach Hotel, Chicago, Ill.

NOVEMBER, 1958

5-6 SAE National Fuels and Lubricants Meeting, The Mayo, Tulsa, Okla.

FEBRUARY, 1959

2-6 ASTM National Meeting, William Penn Hotel, Pittsburgh, Pa.

***MARCH, 1959**

3-5 SAE Passenger Car, Body, and Materials Meeting, Sheraton-Cadillac, Detroit, Mich.

*Tentative

APRIL, 1959

21-23 ASLE Annual Meeting and Exhibit, Hotel Statler, Buffalo, New York.

JUNE, 1959

14-19 SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

21-26 ASTM National Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Patents and Developments

Penetrometer Cone for All Greases

U. S. Patent 2,794,339 issued to L. C. Brunstrum and A. C. Borg, assigned to Standard Oil company (Indiana). A single, simple and inexpensive cone for testing all greases is depicted in the accompanying drawings. Figure 1 is an elevation of the cone in a standard cup. Figure 2 is a vertical section showing a modified ASTM cone, while Figure 3 is a plan view of the adapter cover of Figure 2. The sample cup has an inner diameter of about 3.0 inches and the penetrometer cone has a solid body portion having the configuration of a truncated 90° cone with a base of about 2.73 inches diameter, a short skirt extending from the base of the body portion a distance of 1/16 inch, a stainless steel conical tip extending from the truncated apex of the body portion a distance of about 0.6 inch, a shank fixed to the body portion, and a drilled and tapped bore extending longitudinally within the shank, the gross weight of the assembly being about 102.5 grams.

Ester Base Lubricating Greases

U. S. Patent 2,782,166 issued to J. J. Kolfenbach, A. J. Morway and P. U. Smith, Jr., assigned to Esso Research and Engineering company. Incorporation of large amounts of "complex" esters prepared from polyhydroxy alcohols, such as glycol, (in contrast to esters such as di-2-ethylhexyl sebacate), particularly in lithium base greases, was found to reduce greatly the undesirable swelling of rubber seals, permitting use of wider selection of base lubricants to fit a wide variety of applications. An example of a suitable ester is one formed by reacting two mols of butyl alcohol, one mol of triethylene glycol and two mols of adipic acid. Such esters may be substituted for about 20-60 per cent of the simple ester or oil used as the lubricating vehicle. The complex ester is prepared from a C_4-C_{12} acid partially esterfied with a polyhydric aliphatic alcohol (preferably a glycol having 2-12 carbon atoms, or a polyalkylene glycol having 2-4 carbon atoms in each group). Esterification is completed by using a C_2-C_8 monohydric alcohol.

Grease Using Alkali Fusion of Aldehydes

U. S. Patent 2,801,973 issued to A. J. Morway, J. H. Bartlett and L. A. Mikeska, assigned to Esso Research and Engineering company. Aldehydes (particularly branched chain) are fused at 500°-560°F. with caustic alkali, producing a metal soap (from the acid so formed) which may be incorporated into lubricating oil in grease-making proportions. The reaction involved is:

$$RCHO + MOH \rightarrow H_2 + RCOOM$$

wherein R may be a branched chain aliphatic radical and M is an alkali metal such as sodium or potassium. Suitable aldehydes include those obtained as a by-product or final product of the oxo synthesis, the preferred ones being those having 10 or more carbon atoms per molecule. Octadecenyl aldehyde and similar compounds may be em-

ployed. Soaps of hydrofol acids and similar acids may be employed as solid suspending agents for the alkali when the soaps are produced in situ in the oil.

Thickeners by Alkali Fusion of Polyvinyl Esters

U. S. Patent 2,801,975 issued to J. H. Bartlett and A. J. Morway, assigned to Esso Research and Engineering company. Grease thickeners are produced by treating polyvinyl esters with caustic alkali under fusion conditions at 480°-580°F. The polyvinyl esters should have at least about 24 carbon atoms per molecule or a molecular weight of 50,000-125,000. Polyvinyl acetate is the most desirable because of its low cost and its complex formation. Soaps of higher molecular weight fatty acids may be employed as suspending agents to prevent the caustic from settling when in situ fusion is conducted in the lubricating oil medium. The proportion of alkali is 25-40 wt. per cent of the ester, calculated as NaOH.

News Items

Oronite Chemical company's new synthetic gelling agent gives greases resistance to radiation heat and water. This GA-10 is methyl N-n-octadecylterephthalamate. A sodium GA-10 grease is said to be useful after a dose of 500 megaroentgens (equivalent to about one year's service in values for controlling flow of liquid sodium in a nuclear reactor). Dropping points can be as high as 500°-600° F. in contrast to 350° F. for conventional lithium soap greases (Chem. & Engrg. News, 7/29/57, p. 52).

Automatic grease dispensing equipment: The various systems, laboratory methods, for predicting pumpability of greases, etc. (Lubrication, 8/57).

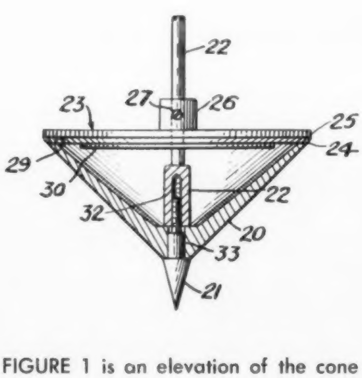


FIGURE 1 is an elevation of the cone in a standard cup used for testing.

News Items

Phenyl stearic acid is available in commercial amounts from Barlow Chemicals, Ossining, N. Y. It is said to be an effective ingredient in greases, etc. (N. Y. Journal of Commerce, 5/22/57 p. 50).

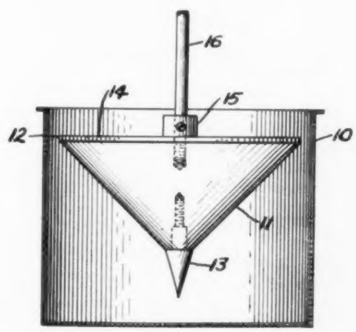


FIGURE 2 is a vertical section showing view of modified ASTM cone.

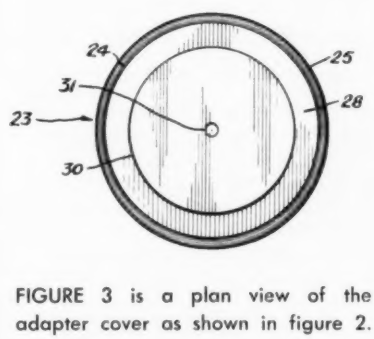


FIGURE 3 is a plan view of the adapter cover as shown in figure 2.

NLGI Associate, Technical Members

CONTAINER AND CLOSURE MANUFACTURERS

American Can Company
4810 Belleview, Kansas City 12, Mo.
Representative—H. T. Rich

American Flange & Manufacturing Company, Inc.
30 Rockefeller Plaza, New York 20, N. Y.
Representative—Richard L. Parish, Jr.

Bennett Industries
Peotone, Illinois
Representative—S. A. Bennett

Central Can Company
2415 West 19th St., Chicago 8, Illinois
Representative—Henry Frazin

Cleveland Container Company
4925 So. Halsted St., Chicago 9, Ill.
Representative—R. D. Sayles

Continental Can Company, Inc.
100 East 42nd St., New York 17, N. Y.
Representative—W. J. Flint

Geuder, Paeschke & Frey Company
324 North Fifteenth St., Milwaukee 1, Wis.
Representative—Neil Savee

Inland Steel Container Company
6532 South Menard Ave., Chicago 38, Ill.
Representative—J. Daniel Ray

Jones & Laughlin Steel Corporation
Container Division
405 Lexington Ave., New York 17, N. Y.
Representative—C. K. Hubbard

National Steel Container Corp.
6700 South LeClaire Ave., Chicago 38, Ill.
Representative—Henry Rudy

The Ohio Corrugating Company
917 Roanoke Ave. S. E., Warren, Ohio
Representative—Lawrence F. McKay

Republic Steel Corporation
Container Division
465 Walnut Street, Niles, Ohio
Representative—Theodore Humphrey

Rheem Manufacturing Company
400 Park Ave., New York 22, New York
Representative—F. J. Blume

Rieke Metal Products Corporation
Auburn, Indiana
Representative—Mahlon E. Rieke

Steel Package Division of National Lead Company
722 Chestnut Street, St. Louis 1, Missouri
Representative—Warren T. Trask

United States Steel Products
Division, United States Steel Corporation
30 Rockefeller Plaza, New York 20, N.Y.
Representative—Wm. I. Hanrahan

Vulcan Containers, Inc.
P. O. Box 161, Bellwood, Illinois
Representative—L. M. Ferguson

ENGINEERING SERVICES

The C. W. Nofsinger Company
307 East 63rd Street, Kansas City 16, Missouri
Representative—C. W. Nofsinger

MANUFACTURERS OF EQUIPMENT FOR APPLICATION OF LUBRICATING GREASES

Aro Equipment Corporation
Bryan, Ohio
Representative—D. G. Reed

Balcrank, Inc.
Disney near Marburg, Cincinnati 9, Ohio
Representative—Richard P. Field

The Farval Corporation
3249 East 80th St., Cleveland, Ohio
Representative—Lee Witzenburg

Gray Company, Inc.
60 Northeast 11th Ave., Minneapolis 13, Minn.
Representative—B. A. Beaver

Lincoln Engineering Company
5701 Natural Bridge Ave., St. Louis 20, Mo.
Representative—G. A. Hubbard

Stewart-Warner Corporation
Alemite Division
1826 Diversey Parkway, Chicago 14, Illinois
Representative—E. G. Wicklatz

Trabon Engineering Corp.
28815 Aurora Rd., Solon, Ohio
Representative—E. W. Baumgardner

MARKETING ORGANIZATIONS

Ampol Petroleum, Ltd.
Buchanan Street
Balmain, New South Wales, Australia
Representative—L. Ashley

California-Texas Oil Company
380 Madison Ave., New York 17, New York
Representative—Hal U. Fisher

Canadian Petrofina Limited
505 Dorchester Street West
Montreal, Quebec, Canada
Representative—M. E. Wight

Cooperative GLF Exchange, Inc.
Terrace Hill, Ithaca, N. Y.
Representative—W. S. Miller

Denco Petroleum Company
5115 Denison Avenue, Cleveland 2, Ohio
Representative—I. L. Carmichael

D-X Sunray Oil Company
Mid-Continent Bldg., P.O. Box 381, Tulsa, Okla.
Representative—J. W. Basore

Farmer's Union Central Exch., Inc.
P. O. Box G, St. Paul 1, Minnesota
Representative—H. F. Wagner

Illinois Farm Supply Company
100 East Ohio Street, Chicago, Illinois
Representative—S. F. Graham

Ohio Farm Bureau Cooperative Association, Inc.
245 North High Street, Columbus 16, Ohio
Representative—Walter N. Callahan

Valvoline Oil Company
Division of Ashland Oil & Refining Co. Box G
Freedom, Pennsylvania
Representative—D. A. Smith

SUPPLIERS OF EQUIPMENT FOR MANUFACTURING LUBRICATING GREASES

Barrett Manufacturing Company
P. O. Box 8096, Houston 4, Texas
Representative—George J. Barrett, Jr.

Chemicolloid Laboratories, Inc.
55 Herricks Road, Garden City Park, N. Y.
Representative—David F. O'keefe

The Girdler Company
A Div. of National Cylinder Gas Co. Box 987
Louisville 1, Kentucky
Representative—J. E. Slaughter, Jr.

Manton-Gaulin Mfg. Co., Inc.
44 Garden Street
Everett 49, Massachusetts
Representative—G. W. Eldridge

Morehouse-Cowles, Inc.
1156 San Fernando Rd., Los Angeles, Calif.
Representative—George E. Missbach

NLGI Associate, Technical Members

Stratford Engineering Corporation
612 W. 47th Street, Kansas City 12, Missouri
Representative—D. H. Putney

Struthers Wells Corp.
1003 Pennsylvania Ave. West, Warren, Pa.
Representative—K. G. Timm

SUPPLIERS OF MATERIALS FOR MANUFACTURING LUBRICATING GREASES

Acme-Hardesty Company
60 East 42nd St., New York 17, N. Y.
Representative—W. C. Hardesty

American Cyanamid Company
30 Rockefeller Plaza, New York 20, N. Y.
Representative—B. H. Loper

American Potash & Chemical Corp.
99 Park Avenue, New York 16, N. Y.
Representative—W. F. O'Brien

Archer-Daniels-Midland Company
Chemical Products Division
P. O. Box 839, Minneapolis 2, Minn.
Representative—J. H. Kane

Armour & Co., Chemical Division
1355 West 31st St., Chicago 9, Illinois
Representative—W. L. Riegler

The Baker Castor Oil Company
120 Broadway, New York 5, New York
Representative—J. W. Hayes

Godfrey L. Cabot, Inc.
77 Franklin Street
Boston 10, Mass.
Representative—H. P. Donohue, Jr.

Climax Molybdenum Company
500 Fifth Ave., New York 36, New York
Representative—Elwin E. Smith

Darling & Company
4201 South Ashland Ave., Chicago 9, Illinois
Representative—G. W. Trainor

E. I. du Pont de Nemours & Co.
Wilmington, Delaware
Representative—R. O. Bender

The Elco Lubricant Corporation
Jennings Road & Denison Avenue
Cleveland 9, Ohio
Representative—Frank X. Sieloff

Emery Industries, Inc.
4300 Carew Tower, Cincinnati 2, Ohio
Representative—G. W. Boyd

Enjay Company, Inc.
15 West 51st St., New York 19, New York
Representative—Sidney W. Fay

Foote Mineral Company
18 W. Chelten Ave., Philadelphia 44, Penn.
Representative—W. F. Luckenbach

A. Gross and Company
295 Madison Avenue, New York 17, N. Y.
Representative—Eugene W. Adams

The C. P. Hall Company of Illinois
5145 West 67th St., Chicago 38, Illinois
Representative—J. E. Stonis

**Harchem Division
Wallace & Tiernan, Inc.**
25 Main St., Belleville, N. J.
Representative—W. G. McLeod

The Humko Co. Chemical Dept.
P. O. Box 4607, 1702 N. Thomas St.
Memphis, Tennessee
Representative—W. J. O'Connell

Lithium Corporation of America, Inc.
Rand Tower, Minneapolis 2, Minnesota
Representative—Walter M. Fenton

The Lubrizol Corporation
Box 3057—Euclid Station, Cleveland 17, Ohio
Representative—J. L. Palmer

Mallinckrodt Chemical Works
2nd & Mallinckrodt Sts., St. Louis 7, Missouri
Representative—D. B. Batchelor

N. I. Malmstrom & Company
147 Lombardy St., Brooklyn 22, New York
Representative—Ivar Wm. Malmstrom

The McGean Chemical Corp.
Midland Building, 101 Prospect Ave., N. W.
Cleveland 15, Ohio
Representative—W. A. Ritchie

Metasap Chemical Corporation
Harrison, New Jersey
Representative—O. F. Lohrke

Monsanto Chemical Company
800 North Twelfth Blvd., St. Louis 1, Mo.
Representative—J. W. Newcombe

National Lead Company
Baroid Sales Div., 111 Broadway, N.Y. 5, N.Y.
Representative—H. H. Farnham

Newridge Chemical Company
7025 West 66th Place, Chicago 38, Illinois
Representative—T. E. Shine

M. W. Parsons—Plymouth, Inc.
59 Beekman St., New York City 38, New York
Representative—Herbert Bye

Synthetic Products Company
1636 Wayside Rd., Cleveland 12, Ohio
Representative—Garry B. Curtiss

Swift & Company
165th & Indianapolis Blvd., Hammond, Ind.
Representative—F. H. Beneker

Vegetable Oil Products Co., Inc.
Vopcolene Division
5568 East 61st Street, Los Angeles 22, Calif.
Representative—C. F. Williams

Witco Chemical Company
122 East 42nd St., New York 17, New York
Representative—E. F. Wagner

TECHNICAL AND RESEARCH ORGANIZATIONS

American Lithium Institute, Inc.
P. O. Box 549,
Princeton, New Jersey
Representative—Marshall Sittig

Battelle Memorial Institute
505 King Avenue, Columbus 1, Ohio
Representative—S. L. Cosgrove

Compagnie Francaise De Raffinage
11 Rue du Dr. Lancereaux, Paris VIIIe, France
Representative—Albert E. Miller

Inland Testing Laboratories
6401 Oakton St., Morton Grove, Ill.
Representative—Dr. Morton Fainman

Institut Francais du Petrole
CMrR—Courtel, 4 Place Bir Hackeim
Rueil—Malmaison (S. et Oise) France

**Laboratoires de Recherches
Purfina S.A.**
98/100 Chaussee de Vilvorde,
Bruxelles (N.O.H.), Belgium
Representative—R. Gillerot

National Rosin Oil Products, Inc.
1270 Ave. of the Americas, N.Y. City 20, N.Y.
Representative—Richard Bender

Petroleum Educational Institute
9020 Melrose Avenue, Los Angeles 46, Calif.
Representative—G. A. Zamboni

Phoenix Chemical Laboratory, Inc.
3953 W. Shakespeare Ave., Chicago 47, Ill.
Representative—Mrs. G. A. Krawetz

Products Development Laboratory
1 Market St., West Warwick, Rhode Island
Representative—Alberic T. DiMasi

People in the Industry

Oronite Elects Hathaway Director And Vice-President

The election of Norman E. Hathaway as director and vice president-marketing for Oronite Chemical company, was announced in San Francisco by T. G. Hughes, president of Oronite.

In his new job, Hathaway will direct all marketing of Oronite chemical products through company sales offices in the United States and overseas.

Succeeds M. L. Baker

Formerly Oronite's general sales manager, Hathaway succeeds Milton L. Baker, who is retiring December 1. His headquarters will continue to be Oronite's home office at 200 Bush Street in San Francisco.

Hathaway joined Oronite, a subsidiary of Standard Oil company of California, in 1954. Prior to this he was director, chemical and rubber division, business and defense services administration, Department of Commerce, in Washington, D. C. During World War II he served as a commissioned officer in the U. S. Navy submarine service.

Hathaway, a native of Corvallis, Oregon, is a graduate of the University of Maryland, with a degree in chemical engineering. He is married, father of four children, and lives in Hillsborough, California.

Four New Board Members Announced By Wallace & Tiernan

The election of Dr. F. Visser't Hooft and Messrs. R. T. Browning, P. E. Sharts and M. T. Tiernan to the board of directors of Wallace & Tiernan incorporated has been announced by Mr. F. G. Merckel, president. The action was taken at the December 5, 1957, meeting of the board of directors and increases the board from ten to fourteen members.

Dr. Visser't Hooft is vice-president in charge of Wallace & Tiernan's lucidol division and has been associated with the company since 1925. The lucidol division produces organic peroxides at plants located in North Tonawanda and Geneseo, N. Y.

Mr. Browning, executive vice-president-elect of Wallace & Tiernan, is responsible for all the company's operations in the fields of chemicals, pharmaceuticals, precision instruments, and chemical feeding equipment.

Mr. Sharts is president of American Machinery Corp., Orlando, Florida, a subsidiary company of Wallace & Tiernan Inc. This organization manufactures equipment used for processing and packaging fresh fruits and vegetables.

Mr. Tiernan is president of the Baker Process company, Belleville,, N. J. The Baker Process company, also a subsidiary of Wallace & Tiernan, produces an automatic continuous dough-mixing process used by the baking industry for the large-scale production of bread.

Elco Lubricant Names Smith Sales Manager

The Elco Lubricant corporation is pleased to announce the appointment of Mr. R. Kennedy Smith to the position of sales manager. Mr. Smith, a graduate mechanical engineer from Purdue university, has had twelve years experience in engineering and technical service at the Lubrizol corporation and the Cleveland Graphite Bronze company.

The Elco Lubricant corporation was founded in 1929. It is engaged in the production of additives which give to industrial and automotive gear lubricants the ability to operate under extreme pressures and high temperatures.

Consumers Coop Director Deceased

P. T. "Tom" Naudet, director of technical research for Consumers Cooperative association, died at his home in Kansas City, Mo., Dec. 11. He had been in ill health about three years, but had worked the day of his death.

Naudet was 57 years old, a native of Medford, Okla. He was graduated from the University of Oklahoma and taught chemistry in high

schools in his native state before becoming a petroleum chemist and technologist with the National Refining company at Coffeyville, Kan., where he lived nineteen years.

In 1945, after CCA had purchased the Coffeyville refinery, he moved to Kansas City to become chief petroleum engineer, manager of the lubricating oil and grease department and then, in 1953, director of technical research. He had an important part in the development of CO-OP multi-purpose grease and other products manufactured by CCA.

He was widely known among the managers and employees of the member cooperatives, having given over the years a great number of talks and demonstrations of CO-OP petroleum products.

He belonged to the Holy Name society of St. Peter's Catholic church, Knights of Columbus, American Chemical Society, American Society of Automotive Engineers, and other professional organizations. He was his firm's NLGI company representative.

Raymond Shaw Dies

Raymond Shaw, founder and president of the Chek-Chart corporation, died December 8 in Chicago. He was 63.

Born in Salamanca, New York, Mr. Shaw spent eighteen years in the publishing and advertising business before he formed the Chek-Chart corporation in 1930.

Chek-Chart answered the long-felt need for organized lubrication and service data as we know it today. Mr. Shaw personally developed the early Chek-Chart lubrication charts that gave service stations, for the first time, manufacturer-approved lubrication diagrams and instructions.

Since that time, publications of the corporation have been accepted as the foremost authority in the field of automotive lubrication and today are used in all free countries of the world. With his brother, the late Harry Shaw, Raymond Shaw founded the Illinois Petroleum Marketers association.

In 1941, Mr. Shaw was called to Washington where he established for the Ordnance department of the United States Army a lubrication program adopted by virtually all branches of the United States Army and, later, by the Canadian Army.

On Friday, December 6, several hundred oil industry executives honored Mr. Shaw with a testimonial luncheon marking his retirement which had been slated for December 31, 1957.

News About NLGI

Production by Pounds Now Requested by NLGI Survey

Questionnaires on the production by pounds during 1957 of all lubricating greases will be released to NLGI Active members in the United States on Wednesday, January 15, 1958. *Sample* questionnaires were mailed to this group on December 2, 1957, in order that producers could familiarize themselves with the forms.

The January 15 mailing of the actual questionnaire itself will be made by the management services division of the national certified accounting firm of Ernst & Ernst . . . the forms will not be marked in any way nor can they be identified. Replies will be destroyed after tabulation. E & E's closing date is March 31, 1958.

Upon receiving the complete report from the accounting firm, NLGI will make the results known to *all* categories of membership, in every country. Planners of the year-long project hope eventually to expand the coverage of the survey as the needs of the membership are made known, until the scope and penetration is of extreme value to not only those with NLGI but the entire petroleum and allied industries.

National Petroleum News Reviews NLGI Meeting And Accomplishments

A write-up in one of the major oil publications last month not only focused attention of the petroleum industry on NLGI but was an excellent capsule of current Institute activities and progress.

In the December issue of *National Petroleum News* the lubrication feature of the month was a review of the recent NLGI annual meeting and under the headline of "Happy Days Are Here Again" the article itemized past, present and future accomplishments of members in the Grease Institute. "NLGI . . . has other irons in the fire for the future. It's going to stress promotion and marketing of its products. It has over $30,000 invested in

Continued on next page

SERVICE AIDS

- **NLGI MOVIE—"Grease, the Magic Film," a 16-mm sound movie in color running about 25 minutes, now released. First print $600, second print $400, third and subsequent orders $200 each (non members add $100 to each price bracket).**

- **VOLUME XX—Bound volume of the NLGI SPOKESMAN from April, 1956 through March, 1957. An excellent reference source, sturdily bound in a handsome green cover . . . $7.00 (NLGI member price) and $10.00 (non-member) plus postage.**

- **BONER'S BOOK—Manufacture and Application of Lubricating Greases, by C. J. Boner. This giant, 982-page book with 23 chapters dealing with every phase of lubricating greases is a must for everyone who uses, manufactures or sells grease lubricants. A great deal of practical value. $18.50, prepaid.**

News About NLGI

Continued from page 34

a promotional color sound film."

The article went on to say that, "NLGI is going to find out more about the industry it represents. This year it will survey its members to come up for the first time with production figures . . . if it works out, the survey will be an annual one."

Board Discusses "Letters to the Editor" Column

During a recent meeting of the Board of Directors of the National Lubricating Grease Institute the question was raised as to just what handling should be given from an editorial standpoint, to letters written to the editor.

Because all marketing and technical material is traditionally submitted to committees of members for review before publication, an impression had grown that comment and opinions were not welcome . . . this is not the case and official Board action was taken to rectify that impression.

Individual Letters Welcomed

Individual letters are welcome and each will be considered on their own merit, as expressions of the membership. Because of space limitations in the journal it was the feeling of the directors that this system was more flexible than to conduct a regular column.

G. M. Herbert Now NLGI Representative For Enjay Company

The Enjay company has named Mr. Gregory M. Herbert, product manager of their Paramins division, as the NLGI Company Representative.

Bryant Chemical Is New Active Member

The eighth new member to join NLGI during 1957 was affiliated recently when Bryant Chemical company, 13650 Helen avenue, Detroit, became an Active member firm. C. P. Bryant holds both positions as NLGI Company and Technical representative.

Maruzen Joins NLGI

As the NLGI Spokesman goes to press the staff is pleased to announce that still another firm has joined the National Lubricating Grease Institute (*see above*). Maruzen Oil of U.S.A. has affiliated in an active capacity with Mr. Hideo Matsunaga as Company Representative. The firm's offices are in New York City, while the parent firm is located in Japan. ■

Industry News

Socony Designs New Credit System

The techniques of modern research, rigorously applied in "typical" service stations rather than in the laboratory, were employed by Socony Mobil Oil company, Inc., in designing its new plastic credit card system.

More than 2,500,000 of the new laminated plastic cards, embossed with each Mobil credit customer's name and account number, were recently mailed, to go into use on January 1. On the same date, Mobil stations from Maine to California mounted special portable imprinting devices on their gasoline pump islands to service the credit cards.

Their use, according to Vernon A. Bellman, Socony Mobil director in charge of marketing, is something new in the petroleum industry—a coast-to-coast application of a standardized credit card and imprinting system.

Mr. Bellman explained how company engineers performed experiments, using stop-watches, tape measures, and a cross-section sampling of service station attendants, to help perfect the details of the system.

The series of tests indicate, he said, that the new system will cut in half the time a Mobil credit customer must spend waiting for his charge slip to be filled out. The average time will drop from 111 seconds to 55 seconds.

The plastic cards are being mailed to credit customers of Socony Mobil and its domestic affiliates, General Petroleum corporation on the West Coast, and Magnolia Petroleum company in the Southwest.

The credit transactions of the Mobil companies have been steadily expanding and are now running at the rate of 50,000,000 transactions a year.

Panther Encourages "Sizzling Sixty" Age

Most American companies are retiring men at the age 65, but the Panther company, 840 North Main street, Fort Worth, Texas, actually encourages application of men past 60. Panther prefers men between the age of 45 to 65 and the company has on its rolls 290 men between the ages of 60 and 80 who are still producing business.

The 60 to 80 age group is known as the "Sizzling Sixty" club complete with its own president, vice president, secretary and sergeant-at-arms.

Of course, as A. B. Canning,

president of the company pointed out, the men must have some sales ability, business judgment and a desire to continue to be active.

"This is not an endeavor to exploit manpower," Canning commented. "Our orientation and training program is too thorough and expensive to waste on curiosity seekers. We are interested in any man who desires to continue active and who wants to continue making money, no matter what his age may be."

Auto-Lube A Offered By Fiske Refining

A new multi-purpose lubricant, Auto-Lube "A," developed to meet all modern automotive grease requirements in the passenger car field is being offered by the lubriplate division of Fiske Brothers Refining company in Newark. The material is a general purpose, medium density, greasetype lubricant recommended for chassis, wheel bearings, universal and other car parts. It has high film strength, low cold test and high melting point, according to the company. Auto-Lube is also waterproof and performs equally well in all weather and during all seasons, states the lubriplate division.

Dow Corning Reference Guide Now Available

Just out: the 1958 Dow Corning reference guide, largest and most complete silicone catalog ever published, claims the firm.

It describes over 150 commercially available Dow Corning silicone products, including many introduced within this past year. Contains detailed charts, tables, graphs and data on properties and performance, along with illustrated examples on how silicones can cut costs, simplify design and add new sales appeal to products in every field of application.

Esso Research Moves Executive Offices

The executive offices of Esso Research and Engineering company, the central scientific affiliate of Standard Oil company (New Jersey), will be located at the Esso research center in Linden, N. J., as of December 2. The firm's headquarters has been in the Esso building, 15 West 51st street, New York.

However, the press bureau of the research company's public relations division will continue to be located at the 15 West 51st street address (Room 2715).

Press queries of an oil research or engineering nature can be directed to either Robert L. Dunne, PLaza 7-3000, Ext. 7488 or William T. Hogan, PLaza 7-3000, Ext. 7898.